WHITE RIVER SHALE OIL CORPORATION

SUITE 500 PRUDENTIAL BUILDING, 115 SOUTH MAIN STREET
SALT LAKE CITY, UTAH 84111
(801) 363-1170

August 16, 1982

Mr. James Smith
Utah Division of Oil, Gas and Mining
4241 State Office Building
Salt Lake City, UT 84114

Dear Mr. Smith:

On July 30, 1982, the White River Shale Oil Corporation submitted a response to the July 21, 1982 Request for Additional Information from the Utah Division of Oil Gas and Mining. In that response we agreed to submit the following information by August 16, 1982:

1. A color coded mylar overlay indicating yearly mining estimates, panel outlines and the layout of all panels to be mined during Phase I.

2. A numerical standard for successful revegetation.

3. An analysis of the topsoil availability for the first 110 acre increment of Phase I (i.e., work through 1985).

Enclosed for your review and comment are the documents listed above. Also, WRSOC will submit a final complete document as an addendum to White River's Mining and Reclamation Plan by October 15, 1982, as requested by DOGM in their August 13, 1982 letter.

WRSOC is currently in the process of preparing a $1.5 million reclamation bond which will be filed with DOGM on a temporary basis (not to exceed one year), as requested in an August 13, 1982 letter from DOGM. This bond will be filed with DOGM with the understanding that BLM and DOGM will come to agreement on a bonding approach which requires WRSOC to have only one reclamation bond acceptable to both agencies. WRSOC will file the bond with DOGM prior to the August 26, 1982, meeting of the Board of Oil, Gas and Mining.

If you have any questions or comments concerning this matter, please call Mr. Ralph A. DeLeonardis or me for assistance.

Sincerely,

James W. Godlove

James W. Godlove
Director of Environmental Affairs

JWG/fb

Enclosures

cc: P. A. Rutledge

As per our response to Question #27 in UDOGM's July 21, 1982, Request for Additional Information, the following is the success standard for revegetation of disturbed areas:

Average cover values for the three dominant habitat types on the Tracts were calculated from the Final Environmental Baseline Report (VTN, Inc.). These values are: Greaswood/ Sagebrush - 16.4%; Juniper - 16.5% and Shadscale - 15.6%. The average per cent cover for these three habitat types is 16.1%.

Using 70% of the total average cover as the criteria for determining revegetation success, the numerical standard for disturbed lands is 11.3%.

WHITE RIVER SHALE PROJECT (WRSP)

TOPSOIL MANAGEMENT PLAN FOR PHASE I

MINING ACTIVITIES - DRAFT

1.0 PURPOSE AND OBJECTIVE

The purpose of this plan is to delineate methods and procedures for recovering and stockpiling topsoil from areas disturbed by construction of the White River Shale Project. It encompasses areas and materials which will be disturbed for Phase I mine development prior to 1985. This plan also includes methods and procedures for maintaining the topsoil stockpiles, and respreading the topsoil as a part of Phase I revegetation work. The plan incorporates requirements, specifications, and procedures found in the following WRSP documents: Phase I Mining Permit application, dated 5 May 1982; letters from White River Shale Oil Corporation (WRSOC) to Utah Division of Oil, Gas, and Mining (UDOGM), dated 24 May 1982 and 8 June 1982; WRSOC Mining Permit Draft Response, dated 30 July 1982, to UDOGM Request for Additional Information, dated 21 July 1982.

The objective of this plan is to ensure, as far as is practicable, that all topsoil which is recoverable from land to be disturbed is salvaged and stockpiled for later use in revegetation. Topsoil is defined as a friable clay loam surface soil suitable, or which can be readily made suitable, to support growth of native plants. Topsoil is reasonably free from subsoil, clay lumps, and other unsuitable materials. The methods and procedures outlined in this plan are designed to reduce the costs of revegetation and

reclamation with respect to topsoil requirements. Topsoil is relatively scarce on Tracts Ua and Ub, particularly within the areas selected for development. Conservation and reuse of native topsoil is an important factor in the WRSP overall revegetation plan for disturbed areas. Implementation of this Topsoil management plan will set the stage for later implementation of the revegetation plans discussed in Section 2.4 of the WRSP Mining Permit application.

2.0 IMPLEMENTATION

The White River Shale Project (WRSP) is managed by The White River Oil Shale Corporation (WRSOC) as agent on behalf of Phillips Petroleum Company, Sunoco Energy Development Co., and Sohio Shale Oil Company. The Ralph M. Parsons Company is engineering and construction management will be provided by Parsons' Resident Construction Manager. Management of construction subcontracts will be provided by resident construction engineers. Technical direction will be provided by Parsons' specialists as necessary during the course of the work. A soils engineer will be provided on site as necessary to provide technical direction during critical topsoil related activities.

Woodward - Clyde Consultants, under a Parsons' subcontract, performed geotechnical and soils evaluations. Parsons will direct construction contractors in conformance with this topsoil management plan. Additionally, WRSOC has been conducting topsoil and revegetation studies. These studies are being conducted by Dr. C. McKell (Native Plants, Inc.)

and provide valuable guidance for construction plans. More detailed information on soils data and descriptions for the project site can be found in The Final Environmental Baseline Report, White River Shale Project (VTN, Inc., Denver, Colorado, October 1977).

3.0 TOPSOIL RECOVERY

Topsoil will be stripped, stored, and/or utilized for reclamation from all areas disturbed by construction, to the extent practicable. The soils on oil shale Tracts Ua and Ub consist of shallow to very shallow soils on sloping to steep upland surfaces cut by numerous intermittent drainages and containing many areas of rock outcropped escarpments. Woodward-Clyde Consultants prepared topsoil stripping maps for Phase I construction areas. These maps, which were submitted to DOGM previously, indicate soil types encountered in each area as well as recommended topsoil stripping depths for each area. Table 1 provides summary descriptions of all soil types encountered.

Parsons will manage earthwork subcontracts. The topsoil stripping maps are intended to serve as guides to earthwork subcontractors during topsoil material recovery operations. Day to day management of topsoil stripping will be provided by Parsons' Resident Construction Engineer. An experienced soils engineer will be on site as necessary to provide technical direction during critical topsoil recovery and stockpiling operations. The soils engineer will also spot check operations to verify that all recoverable topsoil is salvaged and that topsoil is properly

TABLE 1 - SUMMARY DESCRIPTION OF SOIL TYPES*

Soil Map Unit	Description	Comments
100	Torrifluvent Gravelly Sandy Loam 1 to 10 percent slopes.	This map unit consists of gravelly sandy loams greater than 60 inches deep formed in alluvium in drainageways. Topsoil should be stripped to a depth of not more than 3.1 feet for the Torrifluvent gravelly sandy loam soil in map unit 100. Soil material below this depth is considered unsuitable for use as topsoil because of high pH.
101	D Very Gravelly Sandy Loam, 1 to 10 percent slopes.	This map unit consists of coarse sandy loams and sandy clay loams more than 60 inches deep in alluvial drainageways. The recommended topsoil stripping depth for map unit 101 is 3.7 feet.
200	Bs Very Gravelly Sandy Loam, 5 to 50 percent slopes.	This map unit consists of very gravelly and extremely channery sandy loams and sandy clay loams less than 10 inches deep on residual benches. The recommended topsoil stripping depth for map unit 200 is 0.6 feet.
201	Bs - Rock Outcrop Complex, 1 to 15 percent slopes.	This map unit consists of 50% extremely channery sandy loams about 6 inches deep on residual benches and 50% rock outcrop. Areas of soil map unit 201 are considered to be areas of unrecoverable topsoil due to rock outcrops occupying approximately half of the area intricately intermixed with very shallow soil.

TABLE 1 - SUMMARY DESCRIPTION OF SOIL TYPES (cont)

Soil Map Unit	Description	Comments
300	As flaggy sandy loam, 50 to 70 percent slopes	This map unit consists of flaggy and very channery sandy loams and sandy clay loams about 16 inches deep on side slopes of benches and mesas. Areas of soil map unit 300 are considered to be areas of unrecoverable topsoil due to slopes greater than 50 percent.
301	Bs extremely channery sandy loam, 50 to 80 percent slopes.	This map unit consists of extremely channery sandy loams about 6 inches deep on steep side slopes of mesas. Areas of map unit 301 are considered to be areas of unrecoverable topsoil due to slopes greater than 50 percent.
302	As flaggy sandy loam, 50 to 125 percent slopes.	This map unit consists of flaggy and very channery sandy loams and sandy clay loams about 16 inches deep on sideslopes of benches and mesas. Areas of soil map unit 302 are considered to be areas of unrecoverable topsoil due to slopes greater than 50 percent.
400	Disturbed Land	This map unit consists of soils that have been graded, mixed or otherwise disturbed to the extent that the naturally occurring soil layers have been destroyed. Soil material within this area is so highly variable in depth, coarse fragment content, and chemical characteristics within short distances, that an evaluation of topsoil suitability cannot be made. It has been assumed that this area contains no suitable topsoil. The area within map unit 400 has been disturbed by drilling operations.

TABLE 1 - SUMMARY DESCRIPTION OF SOIL TYPES (cont)

Soil Map Unit	Description	Comments
500	F Gravelly Loamy Sand, 1 to 7 percent slopes.	This map unit consists of gravelly loamy sands and gravelly sandy loams less than 20 inches deep on residual benches. The recommended stripping depth for map unit 500 is 1.0 feet.
600	N Very Fine Sandy Loam, 1 to 25 percent slopes.	This map unit consists of very fine sandy loams, silty clay loams and very fine sandy clay loams greater than 60 inches deep formed in alluvium on alluvial fans and stream terraces. The recommended topsoil stripping depth for map unit 600 is 1.0 feet.

*Based on Woodward-Clyde Geotechnical Report, July 1982.

segregated and stockpiled separate from unsuitable subsoils or engineering fill material.

Table 2 indicates the estimated quantities of topsoil to be recovered from each facility area as well as the stockpile location for those quantities. A revised copy of Figure 2 of the Mining Permit application is attached for general reference.

Topsoil removal from designated areas will be stockpiled at locations within the Phase I development area to avoid unnecessary impacts to surrounding areas. Topsoil stockpiles will be designated as either long-term (estimated storage duration exceeding 6 months) or short term (estimated storage duration less than 6 months). Current plans call for two long term stockpiles. A 45,000 cubic yard stockpile will be located near the mine service building. A second larger stockpile will be located near the runoff retention pond above the high water mark and will contain material recovered during construction of the dam and pond. Material in long-term stockpiles will be reserved for use in reclamation of disturbed areas following abandonment.

All other topsoil stockpiles planned at this time will be short-term stockpiles. Topsoil stored in short-term stockpiles will be used for revegetation efforts in the immediate area from which it is recovered, less than six months from the time of recovery. It would be uneconomical to transport such material to any centralized stockpile, and then haul it back

TABLE 2 - TOPSOIL TYPES AND QUANTITIES

Facilities \ Soil Types	100 (yd^3)	101 (yd^3)	200 (yd^3)	500 (yd^3)	600 (yd^3)	Total (yd^3)	Amount Recoverable (yd^3)	Storage Location
Mining Area								
Mine Service Building	0	1700	5800	0	0	7500	6000	
Shaft Area (incl. Admin. Bldg., etc.)	0	1100	3300	0	0	4400	3520	
Decline Area	0	2200	0	0	0	2200	1760	
Exhaust Fan Area	0	0	350	0	0	350	280	
Topsoil Stockpile Area	0	0	2700	0	0	2700	2160	
Lube & Fuel Area	0	0	3400	0	0	3400	2720	Construction Topsoil Stockpile Area (near Service Building)
Substation Area	0	0	1600	0	0	1600	1280	
Sewage Treatment Plant & Effluent Holding Pond	0	0	270	0	0	270	216	
Water Treatment Facility	0	0	760	0	0	760	608	
Mine Roads	0	13,100	2200	0	0	15,300	12,240	
Stockpile Area (Decline/Shaft)	0	550	1300	0	0	1850	1480	
Solid Waste Landfill & Road	0	0	4700	0	0	4700	3760	Local Short-Term Topsoil Stockpile
Runoff Retention Dam	115,000	0	1200	0	0	116,200	92,960	Construction Topsoil Stockpile Area (near Runoff Retention Dam)
Bachelor Camp	0	0	3600	16,500	0	20,100	16,080	Local Short-Term Topsoil Stockpile
Mine Access Road	0	33,600	230	0	0	33,830	27,064	Local Short-Term Topsoil Stockpile
Road to Dam	0	13,800	0	0	0	13,800	11,040	Local Short-Term Topsoil Stockpile
Road to Water Well	0	14,700	5100	0	3800	23,600	18,880	Local Short-Term Topsoil Stockpile
TOTAL	115,000	80,750	36,510	16,500	3800	252,560	202,048	

again for revegetation. For example, topsoil material salvaged during construction of the well access road will be used to revegetate the shoulders of that road as soon as road construction activities are completed. This topsoil will be stockpiled in berms along the road shoulders until it is placed for revegetation. Similarly, topsoil recovered from the bachelor camp site will be stockpiled and reused locally.

Table 3 indicates quantities of topsoil required for local revegetation efforts in specific areas. Any excess topsoil remaining after local revegetation is complete will be transported to the nearest long-term stockpile.

3.1 Clearing and Grubbing

Project areas which will be affected by construction will be cleared of trees, shrubs, and other vegetation, except individual trees as directed by the Resident Construction Manager. Standing trees and other large perishable materials will be cut off at the ground surface and disposed in the solid waste disposal area. Other vegetation will be tract rolled into the topsoil. Burning of trees, stumps, brush, and other perishable material is not permitted. Nonperishable materials shall be transported to, and disposed of in, designated spoil or landfill areas as directed by the Resident Construction Engineer.

TABLE 3 - QUANTITIES OF TOPSOIL REQUIRED FOR LOCAL REVEGETATION

Facility	Topsoil Fill Needed for Revegetation (yd^3)	Excess/Deficit of Topsoil (yd^3)
Mining Area		
Mine Service Building	400	+5600
Shaft Area	5500	-1980
Decline Area	375*	+1385
Exhaust Fan Area	175*	+105
Topsoil Stockpile Area	No topsoil fill required	---
Lube and Fuel Area	200	+2520
Substation Area	275*	+1005
Sewage Treatment Plant and Effluent Holding Pond	350*	-134
Water Treatment Facility	300	+308
Mine Roads	5700	+6540
Stockpile Areas	9000*	-7520
Solid Waste Landfill and Road	No topsoil Fill Required**	---
Runoff Retention Dam	3000*	+89,960
Bachelor Camp	500	+15,580
Mine Access Road	1500	+25,564
Road to Dam	2300	+8740
Road to Water Well	1100	+17,780
TOTAL	30,675	+165,453***

*Estimate Only - (based on the perimeter of the facility and a 10-ft. fill around facility).

**Topsoil recovered from this area will be used to cover wastes in the landfill. The solid waste landfill and road will eventually be entirely covered with spent shale.

***Topsoil Total is only an estimate; actual stockpiled topsoil may be significantly different depending on actual site condition and use.

3.2 Removal of Topsoil

Topsoil is defined as a friable clay loam surface soil suitable, or which can be made suitable, to support growth of native plants. Topsoil is reasonably free from subsoil and clay lumps. Debris, stones, other objects larger than 2 inches in any dimension, and other unsuitable materials will be removed from the surface of areas to be stripped by mowing, grubbing, raking or other suitable methods as required. Any remaining vegetation and organic matter will be trackrolled and ground into the soil. Burning of brush and other perishable material will not be allowed without an approved permit.

Topsoil will be stripped from the surface within the areas to be disturbed to whatever depths are practicable, using the topsoil stripping depth recommendations indicated on the topsoil stripping maps as guides. All stripping shall be conducted in a manner which minimizes intermingling of topsoil with underlying subsoils. It is estimated that 80% of the topsoil present will be stripped, recovered, and stockpiled. This is due to limitations imposed by irregular and steep terrain, the efficiency of heavy equipment, and stripping procedures which are designed to avoid mixing topsoil with subsoil materials. Topsoil stripping maps will be used as guides only. Deviations from recommended stripping depths will be made as warranted by actual field conditions. Such deviations will be approved by the Resident Construction Manager prior to implementation.

3.3 Topsoil Stockpile Development

Topsoil shall be transported to, and stockpiled in, designated storage areas. Locations of long-term topsoil stockpile areas are shown on Figure 1-3 (Sheet 1) of the Mining Permit application, the latest revision of which is attached.

Topsoil stockpiles shall have a concave upper surface or be otherwise shaped to minimize erosion of material. Stockpiles shall be constructed in a manner such that compaction of the topsoil is avoided or minimized, as far as is practicable given the use of heavy equipment. The area for all stockpiles will be graded as necessary to provide a stable base for the pile. The final configuration of the long-term stockpiles will be determined by the quantity of material to be stored and the terrain of the storage site. The stockpile near the mine services building will not exceed fifteen feet in depth. The larger pile near the runoff retention pond is located in a small canyon above the natural drainage channel and will vary in depth of stockpiled material. Diversion ditches or earthen berms will be constructed as needed to divert runoff from surrounding areas. Berms will be built around the downslope periphery of each pile as necessary to prevent loss of sediment due to runoff across the pile. In all cases, topsoil storage areas will be distinct from other soil material storage piles to avoid inadvertent mixing of materials. The soils engineer on site will verify that materials are being properly segregated for storage.

During construction of the stockpiles, wind erosion will be controlled by watering the piles as necessary. If severe weather conditions are anticipated or if significant wind or water erosion occurs at any stockpile, additional control measures will be implemented. Biodegradable soil tackifiers or mulches may also be used during construction of the piles, as conditions warrant.

3.4 Stabilization and Maintenance of Topsoil Stockpiles

As soon as a significant portion of any long-term topsoil stockpile has been developed to its final configuration it shall be treated with a biodegradable soil stabilizer and seeded with the following mixture of annual and perennial plants to prevent wind erosion and provide stabilization during the storage period:

Indian Ricegrass	Oryzopis hymenoides	3 lb PLS/acre
Russian Wildrye	Elymus junceus	3
Western Wheatgrass	Agropyron smithii	3
Cuneate Saltbush	Atriplex cuneata	2
Globemallow	Sphaeralceae coccinea	1
Utah Sweet Vetch	Hedysarum boreale utahensis	2
Beard Tongue	Penstemon sp.	1
		15 lb PLS/acre

All seeded areas shall be kept moist during the vegetation establishment period. Temporary irrigation will be provided as necessary (drip watering, spraying from water trucks, sprinkler systems) to provide adequate watering without causing erosion.

Stabilization and maintenance procedures for short-term stockpiles shall consist of pile configuration, watering, and/or treatment with a biodegradable soil stabilizing agent. All topsoil stockpiles will be inspected on a regular basis by Parsons' Soils Engineer or Resident Construction Engineer to ensure that stabilization and erosion control measures are effective and sufficient. The frequency of these inspections will increase with episodes of high winds and/or rainstorms.

If any long-term topsoil stockpiles develop rivulets six inches in depth over thirty (30) percent of its surface, additional erosion control measures will be implemented. These measures will consist of using excelsior matting, jute netting, or a similar physical slope stabilizer anchored by wire staples. Such measures would provide physical protection against wind and water erosion as well as promoting water retention, thus maintaining a more suitable microhabitat for seed germination and growth. Any long-term stockpile areas requiring such measures shall be reseeded prior to placement of matting or netting, either by broadcast seeding or hydromulching, using the species mix and rate specified in Section 3.4. If erosion of the extent described above occurs on short-term topsoil stockpiles, earthen or straw bale berms will be constructed around such piles to prevent further soil movement. This will prevent soil losses from these piles and subsequent impacts to surrounding vegetation. If wind erosion becomes a problem on short-term stockpiles, the frequency of watering those piles shall be

increased and/or a biodegradable soil stabilizer or tackifier may be applied.

4.0 PLACEMENT OF TOPSOIL

When construction in a particular area has progressed to a point that the areas to be revegetated will not be further disturbed, the stockpiled topsoil will be respread from short term stockpiles over these areas to a nominal depth of eight (8) to ten (10) inches. In areas where subsoils have become compacted the subsoil will be tilled or scarified to a depth of four (4) to six (6) inches, by means of a disk harrow or similar equipment, prior to respreading topsoil. Topsoil will be groomed to a smooth, firm surface by means of a cultipacker or similar equipment. The seedbed will be as free as possible of large debris such as boulders and woody vegetation. Woody vegetation which has grown on stockpiles during the storage period will be trackrolled and spread with the topsoil.

It is currently planned that long-term topsoil stockpiles will remain undisturbed until abandonment. During this period of time soil properties may change, especially in the deeper parts of stockpiles, due to weathering, leaching, and bacterial action. Therefore, topsoil analysis will be conducted prior to spreading of topsoil to determine the suitability of these soils as growth media for reclamation and revegetation efforts. The results of these analyses will be used to determine the desirability of amending stockpiled topsoil material in

order to enhance its utility as a growth medium. Research is currently being done for WRSP to determine the effects of long-term stockpiling of topsoil materials. The two stockpiles near the retention pond and mine service building will be included in this research. The results of this research will be available to guide topsoil rejuvenation plans should such plans prove to be desirable or necessary. Studies related to the revegetation and reclamation of processed shale will continue during Phase I operations. Current and future studies are discussed in the "WRSP Environmental Monitoring Manual", Sections 7.2 and 7.3 (see Appendices B and D). Additional data on revegetation of Processed Shale Disposal Sites" (Utah State University, 1978) and "White River Shale Project Progress Reports 1977 - 1980" (WRSOC, 1978 - 1981).

In the event that the project is abandoned in 1986, approximately 165,000 cu. yd. of topsoil will be available for use in reclamation of disturbed lands (Table 3). The 110 acres disturbed during Phase I development (prior to 1986) could be covered with topsoil to a depth of approximately 11 inches. However, current research suggests that a topsoil layer of 8-10 inches is sufficient for plant establishment in most areas. Therefore, WRSOC anticipates having an excess amount of topsoil relative to reclamation of the initial 110 acres.